National Park Service

Water Quality Standard Operating Procedures

NOTE: These SOPs have been based on the "National Park Service Northeast Region Water Quality Standard Operating Procedures." Information has been updated and changed as needed and appropriate for our area.

1.1.1 Field Data Forms

A field data form is used to document all information collected during water-quality monitoring. All notations are made in either pencil or waterproof pen. Fill in all blanks provided that pertains to the data that you will be collecting. Indicate with a "–"if the data are not available or not applicable but do not leave the entry blank. Blank entry lines leave the people to wonder if the data were forgotten or not available. The following information is to be completed on all field data forms:

- **Surveyor**- Name of person doing the observations.
- **Group #** - The number of your group
- **Site ID** - The name of your assigned River Mile
- **Sampling Location**- Numbered location of sample site. For lakes, this will be the 4 digit MIDAS number unique to each lake.
- **Year, Month, Day, Time**- Sample date and time you arrived at sample site.
- **Method** – What method are you using? Meter and Probe are standard for The River Mile.
- **Air Temperature**- record using thermometer. See below for instructions
- **Wind Speed and Direction**- Determine wind direction and record the appropriate code using the diagram on the left side of the data sheet. Determine wind velocity using a hand-held anemometer or use tree movement/wave height as a guide. Record a single value (for example 7 mph, NOT 5-8 mph) in the space provided.
- **Sun**- Choose and circle the selection that best describes current conditions.
- **Cloud Cover-** Estimate amount of sky obscured by clouds.
- **Photo Documentation-** If a picture was taken, note picture number. See section 1.1.1*Photo Documentation*.
- **Method** – What method are you using? Meter and Probe are standard for The River Mile.

- **Comments**- Any additional information pertaining to the sampling session, such as water clarity, amount of emergent/floating vegetation, unusual occurrences, or equipment problems.

1.1.1 Photograph Documentation

At a minimum, a one-time, digital, photographic documentation of all monitoring sites are included in the metadata. Additional annual and seasonal photograph documentation is encouraged. Take photographs of changes in the site after construction, erosion, flooding, or debris in the channel. Each digital photograph that becomes part of the station record is identified by appending descriptive information such as site, date, or flow rate.

1.1.4 Sample Container Preparation

For single point grab samples, the sample bottle can be used as the sampling device. For composite samples such as depth and (or) width integrated samples, an isokinetic bottle sampler is used in conjunction with a churn in order to collect the sample and ensure it is well-mixed. Select the appropriate sized precleaned and relabeled sample bottle. Samples should be taken in a prearranged priority so that all sample handling and preservation can take place as rapidly as possible. Sample containers, sample size, and preservation requirements for water samples are presented by parameter. Bottles are purchased annually.

1.1.4 Cleaning of Bottles and Equipment

Clean the sample bottle, churn splitter, and all tubing before each field trip. Use a non-phosphate detergent (such as Liquinox) with tap water. Soak in detergent solution for 30 minutes. Wearing disposable, powderless latex or vinyl gloves, scrub with a soft brush. Rinse well with tap water and then rinse with deionized water. Upon arriving at each field site rinse the sample bottle and churn with native water. Place cleaned equipment in clean storage bags. Rinse all sample bottles and (or) collection bottles three times before filling with sample water. After sampling, rinse equipment used (such as the sample bottle, tubing and churn) with deionized water.

1.1.4.1. General Measures

All equipment, apparatus, and instruments must always be kept clean and in good working condition by means of the methods and practices given elsewhere in this protocol. Records are kept of all repairs to the instruments and apparatus and of any irregular incidents or experiences that affect operation. It is essential that standardized and approved methodologies, such as those recommended in this

protocol, be used by field staff. If any changes to the approved methods are made, they must be documented and experimental data obtained to ensure that the results are valid and comparable to the earlier data.

1.1.5. Prevention of Sample Contamination

The quality of data generated in a laboratory depends primarily on the quality of the samples received at the laboratory. Consequently, the field investigator must take the following precautions to protect samples from both contamination and deterioration. There are numerous routes by which samples can become contaminated. Potential sources of trace-metal contamination during sampling include metallic or metal containing sampling equipment, containers, labware, reagents, and deionized water; improperly cleaned and stored equipment; atmospheric inputs such as dirt and dust from automobile exhaust, cigarette smoke, nearby roads, and wires. Human contact can also contaminate the samples. The following are some of the basic contamination prevention methods:

1) Clean collection bottles according to recommended methods.
2) Use only the recommended type of sample bottle for each parameter.
3) Use only water sample bottles for water samples. Do not use bottles that have been used for other purposes, such as storing concentrated reagents.
4) Follow recommended preservation methods. All preservatives must be of analytical grade and included as field blanks for identification of potential contamination.
5) Minimize the possibility of adding the wrong preservative to a sample or cross contaminating the preservative stocks when preserving samples by preserving all the samples for a particular group of parameters together.
6) Do not touch the inner part of sample bottles and caps with bare hands, gloves, mitts.
7) Keep sample bottles in a clean environment, away from dust, dirt, fumes and grime. Vehicle cleanliness is an important factor in eliminating potential contamination of samples and equipment.
8) Keep petroleum products (gasoline, oil, exhaust fumes), prime sources of contamination, away from samples. Exhaust fumes and cigarette smoke can contaminate samples with lead and other heavy metals. Air conditioning units are also a source of trace-metal contamination.
9) Keep filter units and related apparatus clean using procedures such as acid washes and soaking in special solutions, and protected from field contamination.
10) Keep bottles or sample bags, which have been sterilized, sterile until the sample is collected.

11) Keep all foreign, especially metal, objects out of contact with acids and water samples.
12) Store out of the sunlight in the upright position at 4^{o}C in a cool place, ice chest, or equivalent.
13) Ship samples to the laboratory without delay.
14) Keep hands clean while working with water samples and field equipment.

2.1 Safety

Safety of field staff is always the first concern in conducting a sampling program and in the selection of sampling sites. The desired sampling frequency for most monitoring exposes sampling technicians to a variety of potentially hazardous field conditions across all seasons and climatic conditions, in addition to unforeseen, potentially catastrophic, short-term natural events (floods, storms) that can occur during the field effort. As a result, field sampling requires planning that anticipates the risks and dangers to field staff so that precautions can be taken to limit threats to human safety as much as possible. NETN staff must produce a safety plan, or job hazard analysis (JHA) before conducting field work. This plan includes a description of general hazards for field sampling and hazards that are unique to particular monitoring stations within NETN. In addition, the plan includes the nearest hospital facilities to each sampling site, the most direct route from various sampling sites to the hospital, and emergency phone numbers. Applicable elements for a network-specific water-quality-monitoring safety plan that address physical hazards common around water and biological hazards, poisonous plants and animals are also included. A thorough review and familiarity with the safety plan is required of all sampling staff and a copy of the plan for ready reference always accompanies field staff to the field (Penoyer, 2003).

Always check weather conditions before departure, and leave an itinerary with a supervisor or other designee. The safety plan includes at a minimum, the following:

1) Date and purpose of trip,
2) Name of all staff and volunteers on trip,
3) Destination and route,
4) Time of departure and estimated time of return,
5) Radio frequency or cell phone number, and
6) Type of watercraft, if applicable.

2.2 Surface-water Activities

2.2.1 Wading

Examine the section of a stream or river you plan to wade. Check the field folder for information relating to safety, including maximum depths in relation to stage, wading section anomalies such as slippery conditions and drop-offs or holes (a wading rod can be used to help assess streambed conditions), and velocity curves for determining wadable stages. **Do not attempt to wade a stream for which values of depth multiplied by velocity equal or exceed 10 ft^2/s.** For example, a stream only 2 ft deep but with velocities of 5 ft/s or more can be dangerous to wade.

1) Always wear an approved personal floatation device (PFD) when wading in streams. The PFD must fit properly, be rated for your weight, be in good condition, and be kept dry and indoors between trips. Whenever chest waders are worn, a PFD also must be worn.
2) Wear hip boots or chest waders. Boots and waders provide protection from cold and pollutants, as well as from underwater objects. Be aware of the possibility of slipping and going underwater (ft up, head down) while wearing them. Practice wearing hip boots and waders in a controlled, group-training situation that includes immersion in a swimming pool before using for field work. Avoid hip boots with tight ankles or chest waders that are tight fitting at the top. These are difficult to remove in an emergency situation. Hip boots and chest waders with a strap that is pulled closed allow reduce water coming into the boot. Watch for debris floating downstream, such as logs, aquatic vegetation, or "rafts" of animals seeking higher ground. Watch for sand channels that can shift under foot and become quicksand. Watch the stream stage, especially when it could rise rapidly. When wading below a dam or control structure, contact the gate operator before entering the stream.

Note: All safety procedures included here are adapted from Chapter A9 of the USGS National Field Manual and the "National Park Service Northeast Region Water Quality Standard Operating Procedures."